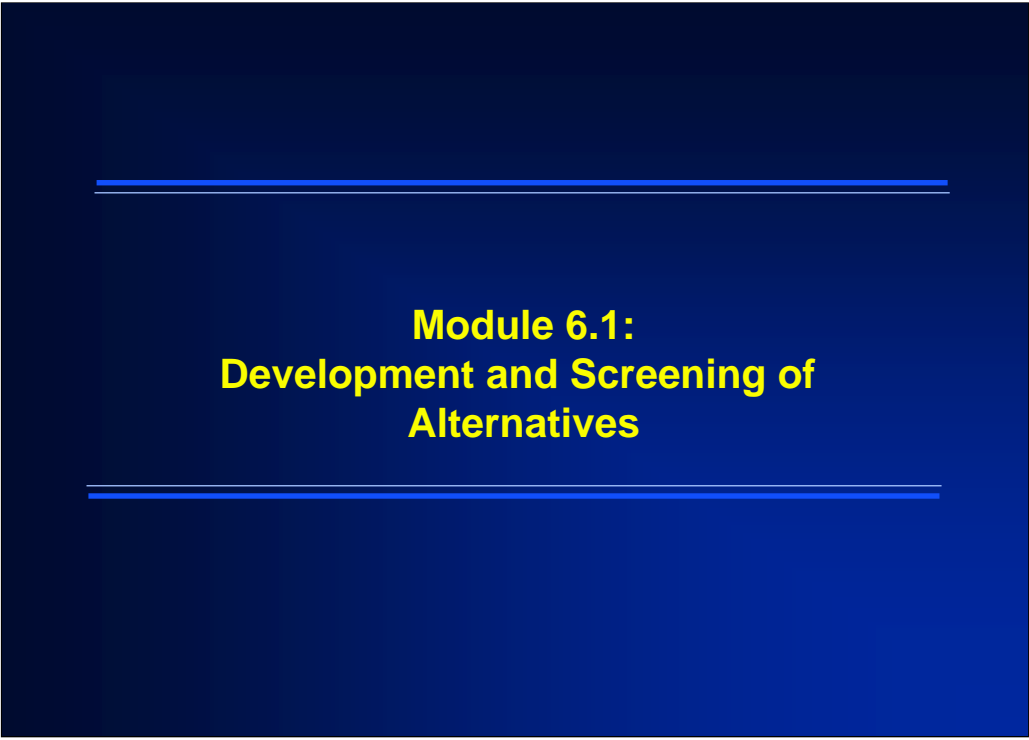

Module 6: Alternatives

Module 6: Alternatives

- **Module 6 contains three sections:**
 - **6.1 Development and Screening of Alternatives**
 - **6.2 Detailed Analysis of Alternatives**
 - **6.3 Remedy Selection, Preparing Projects Plans and the Records of Decision**



Module 6.1: Development and Screening of Alternatives

- The Feasibility Study (FS) process consists of the development and screening of remedial action alternatives and a detailed analysis of a limited number of the most promising options to establish the basis for a remedy selection decision.
- This section focuses on the process of remedial alternative development and offers suggestions for identifying potential remedies. It also presents steps for screening alternatives.
- Key references for this section include:
 - *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*, Interim Final, EPA, OSWER Directive 9355.3-01, October 1988.
 - *The Feasibility Study: Development and Screening of Remedial Action Alternatives*, EPA, OSWER Directive 9355.3-01FS3, November 1989.

Module Objectives

- ❑ Explain the relationship between alternatives selection and EPA Superfund program expectations
- ❑ Identify the options for source control
- ❑ Identify the steps in the alternative development process
- ❑ List the two reasons for communicating early with the regulators during alternative development

Objectives for Choosing Alternatives

- ❑ **Develop an appropriate range of distinct hazardous waste management alternatives that:**
 - **Protect human health and the environment**
 - **Attain ARARs**
 - **Are cost-effective**
 - **Utilize permanent solutions and treatment technologies to maximum extent practicable**

5

- These are the requirements stated in CERCLA Section 121.
- Development and screening of alternatives is initiated during scoping and is continued and refined as more information about the site becomes available. That is, alternatives are developed concurrently with the RI site characterization. The results of one influence the other in an iterative fashion. (RI data are used to develop alternatives, and the range of alternatives guides subsequent RI activity, including treatability studies.)
- Early screening of alternatives helps identify likely FS data needs early on, so they can be addressed during the RI.

Development of Alternatives

- Range of practicable alternatives should reflect program expectations
 - Address principal threats through treatment
 - Use engineering controls for waste that poses low long-term threat or where treatment is impracticable
 - Use institutional controls primarily as supplements to engineering controls
 - Combine approaches, as appropriate
 - Consider innovative technologies, as appropriate
 - Return ground water to its beneficial uses within a reasonable timeframe
- Response actions selected for sites with similar characteristics should be considered and evaluated

6

- Principal threats include liquids and highly toxic and/or highly mobile wastes.
- Engineering controls (non-treatment alternatives) include containment.
- By considering response actions selected for sites with similar problems or contaminants, you are identifying alternatives that have a high potential of being an effective solution. For example, approaches to radioactive wastes in tanks and soils have already been developed at several sites.
- For most chemical wastes, candidate technologies are well developed, but some are still very costly or time-dependent. Fewer well-defined technologies exist for radionuclides, and even less work has been done involving treatment of radioactive mixed waste.

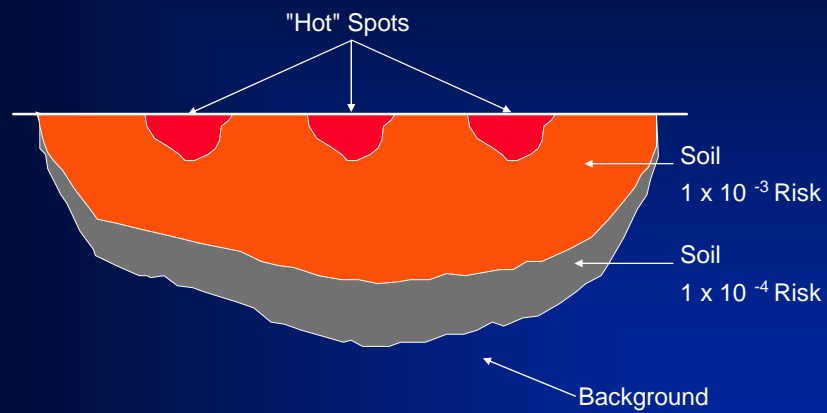
Range of Source Control Options

- ❑ Treatment option to eliminate, or minimize to extent feasible, need for long-term management
- ❑ Treatment options that address principal threats
- ❑ Innovative treatment technologies, as appropriate
- ❑ One or more containment options utilizing little or no treatment
- ❑ No action alternative

7

- Your range of alternatives includes the options listed above.
- The no action alternative is used as a baseline to compare other alternatives. Measures such as actions taken to reduce the potential for exposure (e.g., site fencing) should not be included as components of no action alternatives. Such minimal actions should be studied as a separate, limited-action alternative. Environmental monitoring, however, may be included as part of a no action alternative.
- Consideration of the no action alternative is required by the NCP.
- Development of a complete range of treatment alternatives will not be practical in some situations. For example, for sites with large volumes of low concentration wastes, an alternative that eliminates the need for long-term management may not be reasonable given site conditions, the limitations of technologies, and extreme costs.
- Most of the options shown on this slide are discussed on the following four pages. Innovative technologies are addressed near the end of this section.

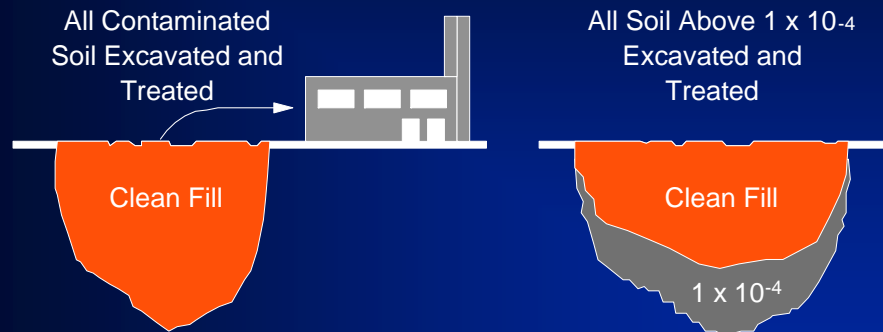
Source Control



8

- This slide shows a no action alternative.
- There are a few cases in which the no action alternative is appropriate:
 - The contaminants at the site pose no risk.
 - CERCLA does not provide the authority to take an action (e.g., the material is excluded from CERCLA response).
 - Previous response eliminated the need for further response (e.g., a removal was conducted at the site).

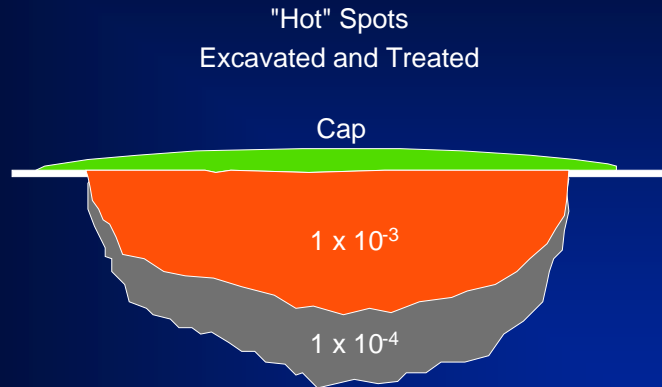
Eliminate/Minimize Need for Long-Term Management



9

- This slide shows options for a situation in which treatment will either eliminate or minimize the need for long-term management.
- Treatment does not necessarily mean that the wastes may be managed as non-hazardous waste. Long-term management of residuals may still be required for regulatory reasons or to protect human health and the environment.
- Treatment can be in-situ (e.g., soil vapor extraction) or ex-situ (e.g., excavate and incinerate). DOE sites often evaluate in-situ options because limited treatment and disposal capacity is currently available.

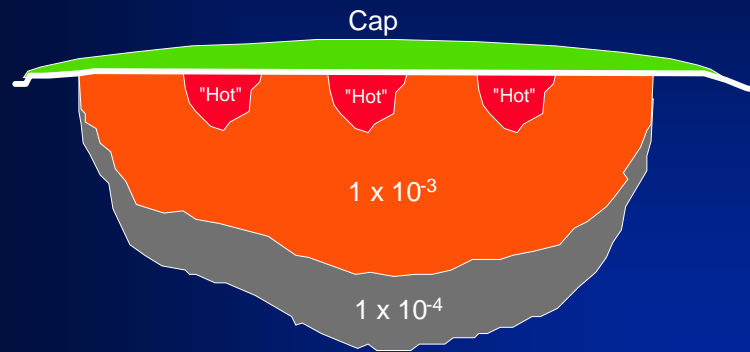
Treatment To Address Principal Threats



10

- This slide shows an alternative using treatment to reduce the toxicity, mobility, or volume of only principal threats at a site.
- Under this option, hot spots, which represent the main threat, are excavated and treated. The remaining waste is capped without treatment.

Containment With Little or No Treatment



11

- This slide shows a situation in which containment (in this case, a cap) with little or no treatment is used. Various institutional controls, such as a fence or land use restrictions, may accompany this alternative.
- This option requires long-term operation and maintenance.
- All sites of the magnitude of DOE facilities should develop a full conceptual range of alternatives.

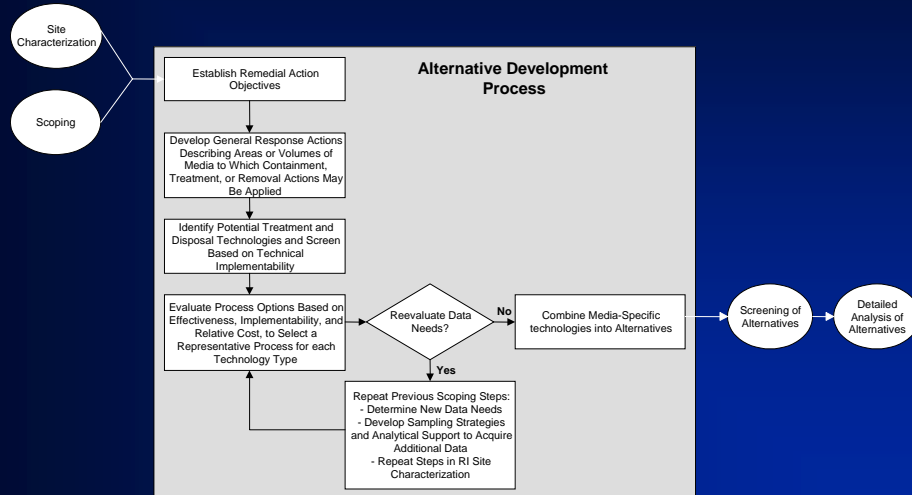
Alternative Development Process

- ❑ Develop remedial action objectives (RAOs)
- ❑ Develop general response actions
- ❑ Identify volumes or areas of media to which general response actions may be applied
- ❑ Identify and screen technologies and process options
- ❑ Evaluate process options
- ❑ Assemble alternatives

12

- This slide shows the steps in the alternative development process. These steps are discussed in more detail in the following slides.
- Figure 4-1 in the *RI/FS Guidance* provides example remedial action objectives, general response actions, technology types, and process options for the development of alternatives.

Alternative Development Process



13

- The Alternative Development Process is shown in the above slide. Each of these steps are described in more detail below.
 - ▶ Develop remedial action objectives specifying the contaminants and media of interest, exposure pathways, and preliminary remediation goals that permit a range of treatment to be developed. The preliminary remediation goals are developed on the basis of chemical specific ARARs, when available, other available information (e.g., RfDs), and site-specific risk-related factors
 - ▶ Develop general response actions for each medium of interest defining containment, treatment, excavation, pumping, or other actions, single or in combination, that may be taken to satisfy the remedial action objectives for the site.
 - ▶ Identify volumes or areas of media to which general response actions may be applied, taking into account the requirements for protectiveness as identified in the remedial action objectives and the chemical and physical characterization of the site.
 - ▶ Identify and screen the technologies applicable to each general response action to eliminate those that cannot be implemented technically at the site. The general response actions are further defined to specify remedial technology types (e.g. the general response action of treatment can be further defined to include chemical or biological technology types)
 - ▶ Identify and evaluate technology process options to select a representative process for each technology type retained for consideration. Although specific processes are selected, for alternative development and evaluation, these processes are intended to represent the broader range of process options within a general technology type.
 - ▶ Assemble the selected representative technologies into alternatives representing a range of treatment and containment combinations, as appropriate.

Communication During Development/ Screening Alternatives

- **Meet with lead/support agency to obtain early agreement on:**
 - **Technologies/alternatives to be considered**
 - **ARARs**
- **Lead agency continues communication with community, as appropriate**

14

- Communication among the lead and support agencies and their contractor is very important in order to obtain input and agreement on the technologies, processes, and alternatives considered for implementation at the site.
- Communication should occur to facilitate the initial screening of technologies and process options, to agree on what additional site data may be needed, and to gain input and agreement on the choice of representative processes and combinations to be used to assemble alternatives.
- Community relations activities should be site- and community-specific and are usually stipulated in the community relations plan. In general, community relations activities during alternative development and screening are most appropriate if citizens are significantly concerned over site conditions and RI/FS activities.

Module Summary

- **Hazardous waste management alternatives must:**
 - Protect human health and the environment
 - Attain ARARs
 - Be cost effective
 - Utilize permanent solutions and treatment technologies to maximum extent practicable
- **Source control options include:**
 - Eliminating/ minimizing need for long term management
 - Treatment to address principal threat
 - Innovative treatment technology
 - Containment with little or no treatment
 - No action

15

Module Summary

- ❑ Range of practicable alternatives should reflect program expectations.
- ❑ Communication among the lead and support agencies and their contractor is very important in order to obtain input and agreement on the technologies, processes, and alternatives considered for implementation at the site.

Module 6.2

Detailed Analysis of Alternatives

- This section describes the alternatives analysis process and the nine criteria on which remedy decisions are based. It also discusses the individual and comparative analyses that are used once the alternatives have been assessed against the nine criteria.
- The next section will illustrate how to use the nine criteria in decision making.
- Key references for this section include:
 - ▶ *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*, Interim Final, EPA, OSWER Directive 9355.3-01, October 1988.
 - ▶ *The Feasibility Study: Detailed Analysis of Remedial Action Alternatives*, EPA, OSWER Directive 9355.3-01FS4, March 1990.
 - ▶ *National Oil and Hazardous Substances Pollution Contingency Plan (NCP)*, March 8, 1990, 55 FR 8719.

These documents are included in the handouts for this course.

Module Objectives

- ❑ Identify the three purposes of the detailed analysis of alternatives
- ❑ Identify and define the nine criteria for alternatives analysis

Detailed Analysis

Purpose is to provide sufficient information to:

- ❑ Compare alternatives
- ❑ Construct remedy selection rationale
- ❑ Demonstrate satisfaction of statutory requirements
 - Documentation
 - Public notice and comment

19

- In this stage of the process, you will sufficiently characterize the alternatives that survived the initial screening to describe the differences between them and to demonstrate that mandatory requirements can be met. This stage is not the decision making process itself -- decision making is discussed in the next section of this course.
- The development, screening, and detailed analysis of alternatives may overlap, with one phase beginning before another is completed.
- The extent to which alternatives are analyzed during the detailed analysis is influenced by:
 - the available data
 - the number and types of alternatives being evaluated
 - the degree to which alternatives were analyzed during their development and screening.
- The detailed analysis should be tailored to the scope and complexity of the site or operable unit.

Nine Criteria

- ❑ Overall protection of human health and the environment
- ❑ Compliance with applicable or relevant and appropriate requirements
- ❑ Long-term effectiveness and permanence
- ❑ Reduction of toxicity, mobility or volume through treatment
- ❑ Short-term effectiveness
- ❑ Implementability
- ❑ Cost
- ❑ State acceptance
- ❑ Community acceptance

20

- This slide lists the nine criteria that must be used to evaluate the alternatives. These criteria are discussed in detail on the following pages.
- The criteria are divided into three groups:
 - The first two criteria are the threshold criteria. They relate to statutory requirements each alternative *must* satisfy to be eligible for selection.
 - The next five are the primary balancing criteria upon which detailed analysis is primarily based.
 - The last two are modifying criteria. After formal public comment is considered, the lead agency may modify aspects of alternative or choose another based on these criteria.
- These groupings are not used until the decision making stage (discussed in the next section of this course).

Definitions of Nine Criteria

Overall protection of human health and the environment

- A remedy must be protective. This means reduction of risk to acceptable levels:
 - 10^{-4} to 10^{-6} for carcinogens
 - Hazard Index of 1 or less for noncarcinogens

Compliance with applicable or relevant and appropriate requirements

- A remedy must comply with ARARs (unless a waiver is used).
- For each alternative, compliance with chemical-, location-, and action-specific ARARs should be addressed.
- Six ARARs waivers are available:
 - Interim remedy (final remedy will comply with ARARs)
 - Compliance will result in greater risk to human health and the environment
 - Technical impracticability
 - Alternative action will attain equivalent standard of performance
 - State requirement not consistently applied
 - Fund balancing (not available for DOE)

Long-term effectiveness and permanence

- *What is "permanence"?* EPA evaluates permanence to the maximum extent practicable as the degree of long-term effectiveness and permanence afforded by a remedy. This is judged along a continuum, with remedies offering greater or lesser degrees of long-term effectiveness and permanence.

Reduction of toxicity, mobility or volume through treatment

- There is a preference for treatment as a principal element of the remedy. This preference is satisfied when treatment is used to reduce the principal threats at a site through destruction of toxic contaminants, reduction of the total mass of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media.

Short-term effectiveness

- The assessment of potential impacts on the community during remedial actions addresses any risk that results from implementation of the remedy, such as dust from excavation, transportation of hazardous materials, or air quality impacts from a stripping tower operation. This assessment considers who may be exposed, what risks those populations may face, how those risks can be mitigated, and what risks cannot be readily controlled. Workers are included in the population that may be affected.

Definitions of Nine Criteria (Con't)

Implementability

- Factors to consider when assessing technical feasibility include:
 - Difficulties and unknowns associated with construction and operation. This was initially identified for specific technologies during the development and screening of alternatives and is addressed again in the detailed analysis for the alternative as a whole.
 - Reliability of technology. This focuses on the likelihood that technical problems associated with implementation will lead to schedule delays.
 - Ease of undertaking additional remedial action. This is particularly applicable for an FS addressing an interim action at a site where additional operable units may be analyzed at a later time.
 - Monitoring considerations. This addresses the ability to monitor the effectiveness of the remedy
- This step may also involve identifying any constraints or inconsistencies between an option and existing compliance agreement conditions or other site-specific conditions.

Cost

- Consider both capital and operation and maintenance costs.

State acceptance

- Unlike RCRA, States are not delegated selection of remedy decision authority under Superfund. Instead, they have the opportunity to "concur."

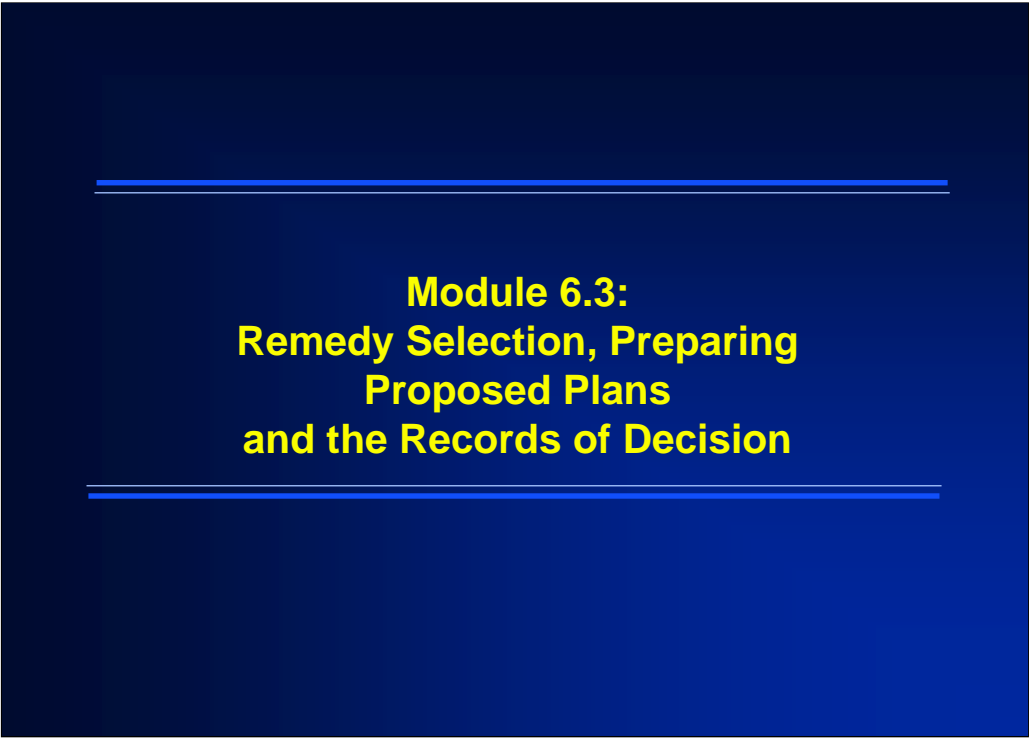
Community acceptance

- As with state acceptance, this criterion will be addressed in the ROD once comments on the RI/FS report and proposed plan have been received.

Module Summary

- ❑ The purpose of the detailed analysis is to compare the alternatives that survived the initial screening, describe the differences among them, and demonstrate whether the alternatives satisfy mandatory requirements.
- ❑ Comparison of the alternatives will be based on nine criteria. The criteria are divided into three groups:
 - The first two criteria are the threshold criteria. They relate to statutory requirements each alternative *must* satisfy to be eligible for selection.
 - The next five are the primary balancing criteria upon which detailed analysis is primarily based.
 - The last two are modifying criteria. After formal public comment is considered, the lead agency may modify aspects of alternative or choose another based on these criteria.

23



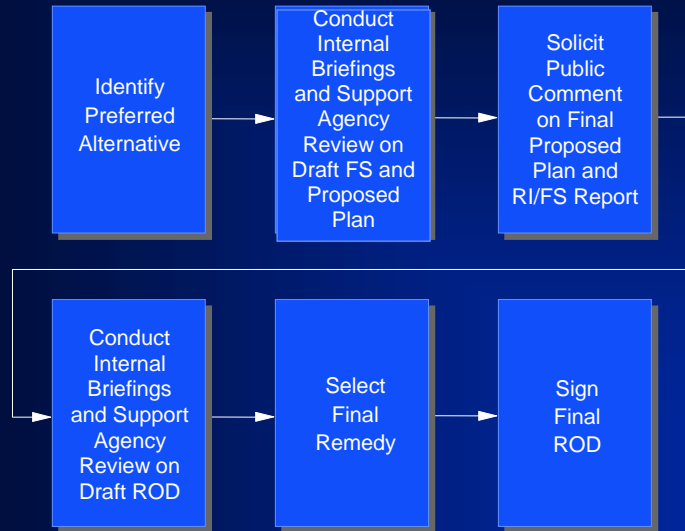
Module 6.3: Remedy Selection, Preparing Proposed Plans and the Records of Decision

- The remedy selection process is the decisionmaking bridge between the analysis of remedial alternatives and the explanation of the selected remedy that is documented in the Record of Decision (ROD).
- This section discusses each step in the remedy selection process and offers some examples of how a remedy might be selected.
- Key references for this section include:
 - *A Guide to Selecting Superfund Remedial Actions*, EPA, OSWER Directive 9355.0-27FS, April 1990.
 - *National Oil and Hazardous Substances Pollution Contingency Plan*, 55 FR 8666, March 8, 1990.
 - *Guide to Addressing Pre-ROD and Post-ROD Changes*, EPA, OSWER Publication 9355.3-02FS-4, April 1991.
 - *Guidance of Preparing Superfund Decision Documents*, EPA Directive 9355.3-02.

Module Objectives

- ❑ Identify the steps in the remedy selection process
- ❑ Define Proposed Plan and identify its purpose
- ❑ Explain how the two screening thresholds, the five balancing criteria, and the two modifying criteria are used during the alternatives selection process

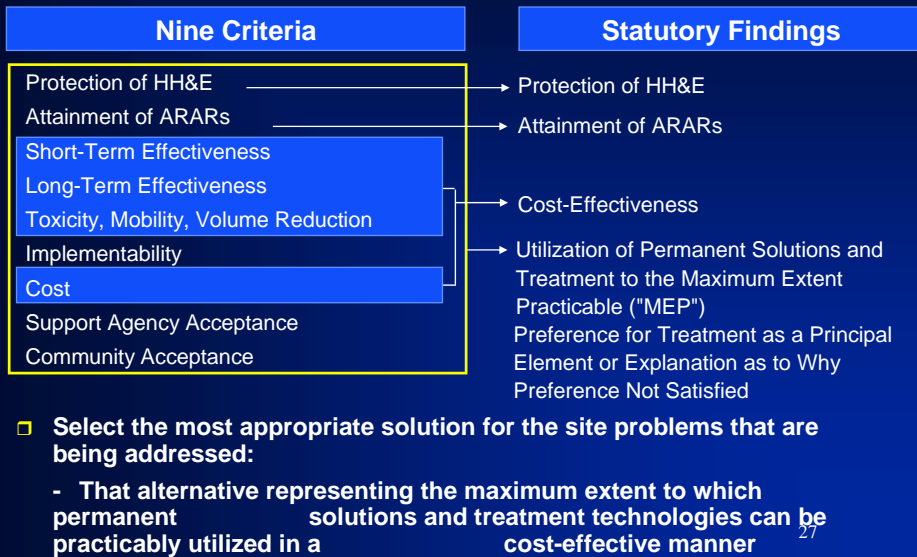
1. Overview of Remedy Selection Process



26

- The remedy selection process begins with the identification of a preferred alternative from among those evaluated in detail in the FS. Support agencies should be involved in this identification.
- Note that the term "preferred," not "selected," is used at this stage.
- The preferred alternative is presented to the public in a Proposed Plan that is issued for comment along with the RI/FS.
- Upon receipt of public comments on the Proposed Plan, involved agencies should be consulted to determine if the preferred alternative is still the most appropriate action for the site.
- The final remedy is selected and documented in the ROD.
- The process at DOE sites is more complex:
 - EPA is still the Agency that finally selects the remedy. However, the entire FFA process is designed to obtain consensus among all parties.
 - DOE has its own internal processes to review and select its preferred alternatives, involving contractors, field offices, and Headquarters.

2. From Nine Criteria to Statutory Findings



- This slide shows how the nine criteria meet the statutory requirements and findings.
- The national goal of the remedy selection process is "to select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste." (NCP 300.430(a)(1)(i)).
- CERCLA places an emphasis on achieving protection through the use of treatment. The NCP presents EPA's expectations for circumstances under which treatment, engineering controls, and institutional controls are likely to be appropriate (40 CFR 300.430(a)(1)(iii)).

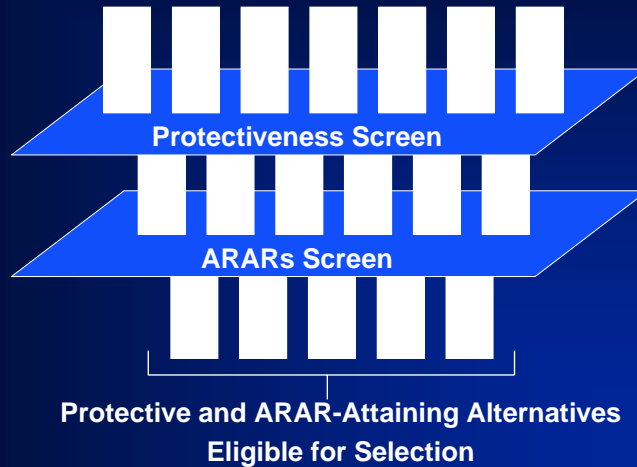
Proposed Plan: Review Results of Detailed Analysis

- ❑ **Individual assessment of alternatives against nine criteria**
- ❑ **Comparative analysis to assess relative performance of alternatives in terms of nine criteria**

28

- The Proposed Plan summarizes the results of the detailed analysis, which was discussed earlier in this course. It provides a brief summary of all of the alternatives studied in the detailed analysis, highlighting the key factors that led to the identification of the preferred alternative.
- The purpose of the Proposed Plan is to facilitate public participation in the remedy selection process by:
 - Identifying the preferred alternative and explaining the reasons for the preference
 - Describing other remedial options that were considered in detail in the RI/FS
 - Soliciting public comment on all of the alternatives described
 - Providing information on how the public can be involved
- Proposed Plans are not detailed enough to replace all of the public participation activities that should have occurred earlier. However, Proposed Plans should not have significant surprises -- their base should already be established.

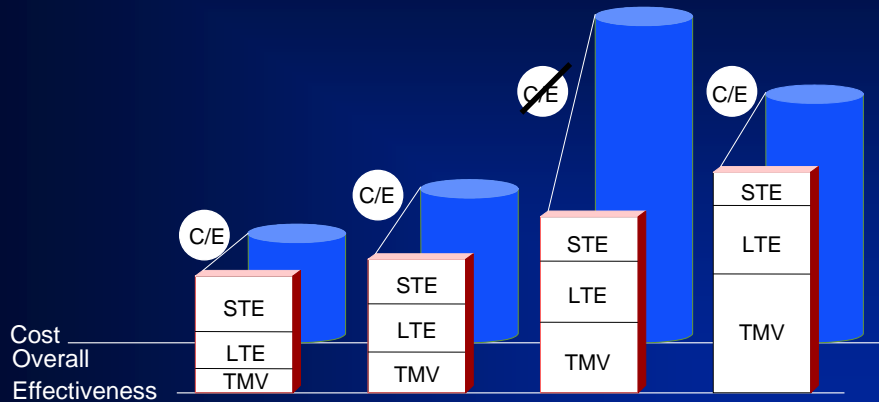
Proposed Plan: Identify Threshold Alternatives



29

- The first step in selecting a preferred alternative for the Proposed Plan is screening the alternatives for protectiveness and compliance with ARARs.
- As mentioned in the Detailed Analysis of Alternatives section, an alternative must be protective of human health and the environment and must comply with ARARs to be eligible for selection as the remedy.
- This slide presents this point:
 - Several alternatives are under consideration and may meet both the protectiveness and ARARs compliance criteria.
 - One of the alternatives in the slide is screened out because it is determined not to be protective. Another is screened out because it will not meet ARARs. (Remember that some alternatives that will not meet ARARs may remain eligible for selection if a waiver is justified.)
- Alternatives that do not satisfy the threshold criteria should not be evaluated further. The alternatives that survive this screening will next be compared to the primary balancing criteria, as described on the following pages.
- The no action alternative is retained throughout this analysis through the ROD as a counterbalance and point of reference. It can only be selected, however, if it meets the thresholds.

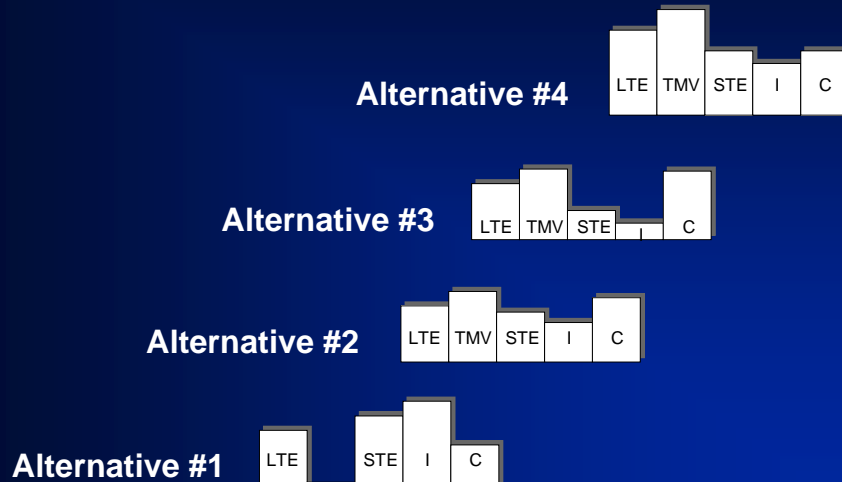
Cost-Effectiveness Analysis



30

- The next step involves the balancing of tradeoffs among alternatives with respect to cost- effectiveness.
- Cost-effectiveness is determined by comparing the costs of all alternatives being considered with their overall effectiveness to determine whether the costs are proportional to the effectiveness achieved.
- Overall effectiveness for the purpose of this determination includes:
 - Long-term effectiveness and permanence (LTE)
 - Reduction of toxicity, mobility, and volume through treatment (TMV)
 - Short-term effectiveness (STE)
- The graphic on this slide represents the cost-effectiveness analysis exercise. The boxes represent effectiveness (LTE + TMV + STE). The cylinders represent cost. The object of this exercise is to get the biggest box for the smallest cylinder.
- More than one alternative can be cost-effective. In the above picture, the first, second, and fourth alternatives are cost-effective. The third one is not, because the cost is not proportionate to the effectiveness of the alternative.

Preliminary "MEP" Balancing



31

- CERCLA Section 121 specifies that the remedial action must utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable (MEP).
- The "MEP" determination is based on comparison of the following five primary balancing criteria:
 - ▶ **Long Term Effectiveness and Permanence-** Long-term effectiveness is one of the two most important criteria used to determine the maximum extent to which permanence and treatment are practicable. This factor will often be decisive where alternatives vary significantly in the types of residuals that will remain on site and/or their respective long-term management controls.
 - ▶ **Reduction in Toxicity, Mobility, or Volume through Treatment-** This is the other criterion that will be emphasized in determining the maximum extent to which permanence and treatment are practicable. Remedies that use treatment to address materials comprising the principal threats posed by a site are preferred over those that do not.
 - ▶ **Short-term Effectiveness** - This includes the time required for each alternative to achieve protection, as well as adverse short-term impacts that may be posed by their implementation. Poor short-term effectiveness can weigh significantly against an option.
 - ▶ **Implementability-** Implementability is particularly important for evaluating remedies at sites with highly heterogeneous wastes or media that make the performance of certain technologies highly uncertain. It is also significant when evaluating technologies that are less proven and alternatives that are dependent on a limited supply of facilities (e.g., TSCA-permitted land disposal facility), equipment (e.g., in-situ vitrification units), or experts.
 - ▶ **Cost-** Cost may play a significant role in selecting between options that appear

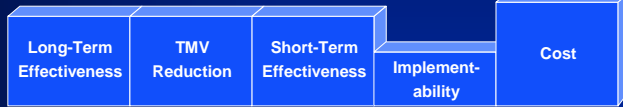
ROD: Final Remedy Selection

Screens:

Adequate Protection?

ARAR-Attaining?

Primary
Balancing
Factors:



Modifying
Considerations:

*Support
Agency
Acceptance*

*Community
Acceptance*

*Preference for
Treatment as a
Principal
Element*

32

- This graphic summarizes the factors you must consider in selecting a remedy:
 - ▶ The remedy must pass the screens.
 - ▶ Most of the balancing will be done between cost, effectiveness, and reduction of toxicity, mobility, or volume. Implementability is also a balancing factor.
 - ▶ You may need to modify the remedy based on state and local concerns or the preference for treatment.

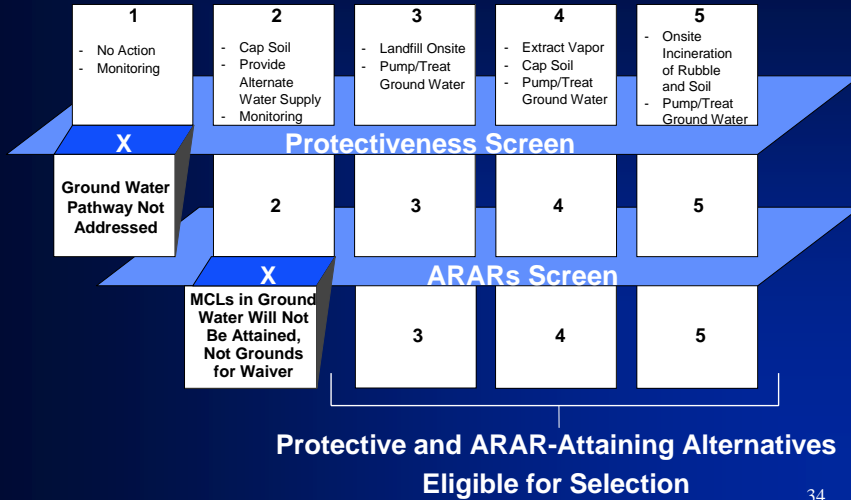
3. Examples

- ❑ **Example 1: Preferred alternative selected as remedy**
- ❑ **Example 2: Preferred alternative no longer cost-effective**
- ❑ **Example 3: Preferred alternative no longer “MEP”**
- ❑ **Example 4: Community opposition requires re-evaluation of “MEP” balancing**

33

- The remainder of this section provides some examples of how a remedy may be selected. One of these examples assumes that the preferred alternative is selected. However, very often changes will need to be made to the preferred alternative, or another alternative will be selected. The remaining three examples assume that the preferred alternative must be re-examined.
- The same alternatives, which are introduced in Example 1, will be used in each example.

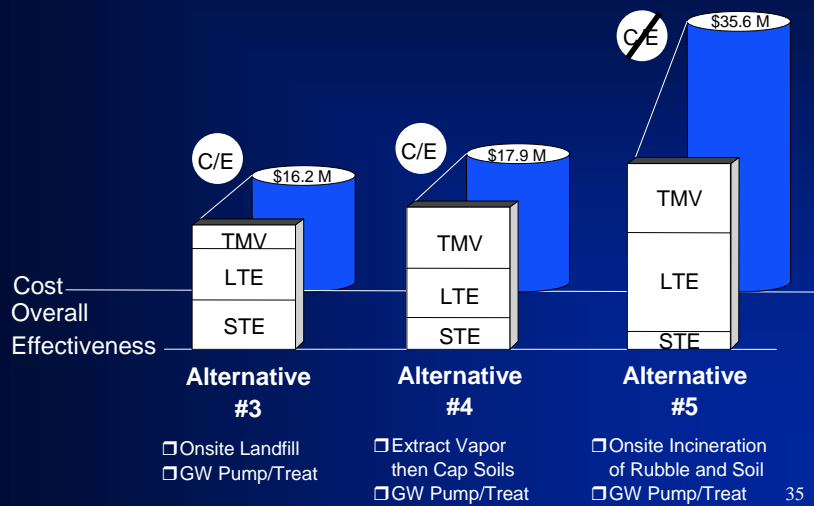
Example 1: Preliminary Protectiveness and ARAR Findings



34

- The site in our examples has soil and groundwater contamination, and the contaminants of concern are VOCs and semi-volatiles. There are buildings and debris on site and a residential area nearby. The aquifer is a potential (but not current) source of drinking water.
- The first alternative (no action) was screened out because it would not be protective. (However, the no action alternative will be discussed in the ROD as a baseline.)
- Alternative 2 was screened out because it would not attain ARARs for ground water.

Example 1: Preliminary Cost-Effectiveness Determination



- The cost-effectiveness analysis reveals that Alternative 5 is not cost-effective.
- Screening out Alternative 5 might be difficult if neither Alternative 3 nor 4 contained a treatment component.
 - It is important to weigh criteria relative to each other. Remember that there is a preference for treatment.
 - Also keep in mind that an alternative that does not involve treatment may not provide much long-term effectiveness.

Example 1: Preliminary "MEP" Balancing

Protective, ARAR-Attaining, and C/E Alternatives Eligible for Selection

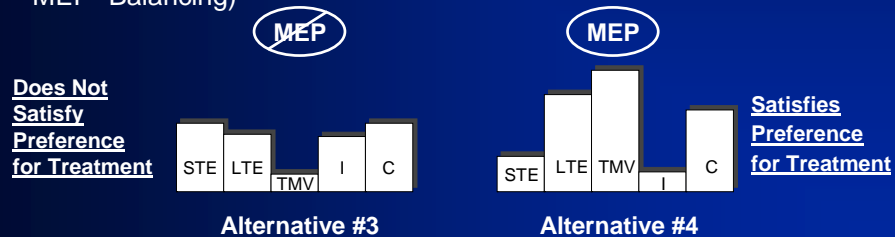
Alternative #3

- ☐ Onsite Landfill
- ☐ GW Pump/Treat

Alternative #4

- ☐ Soil Vapor Extraction
Followed by Cap
- ☐ GW Pump/Treat

Identify Alternative that Appears to Provide Best Balance (Preliminary "MEP" Balancing)



- This is an example of how the preference for treatment worked in selecting the remedy. Alternative 5 was dropped because it was not cost-effective. Alternative 4 appears to provide a balance among the criteria and satisfies the preference for treatment.

Example 1: Preferred Alternative Selected as Final Remedy

- ❑ No new information provided in public comment that changes preliminary statutory determinations
- ❑ State and community find preferred alternative acceptable

37

- Even when the preferred alternative is selected as the remedy, it may be necessary to make small changes in how the remedy is implemented, based on comments.

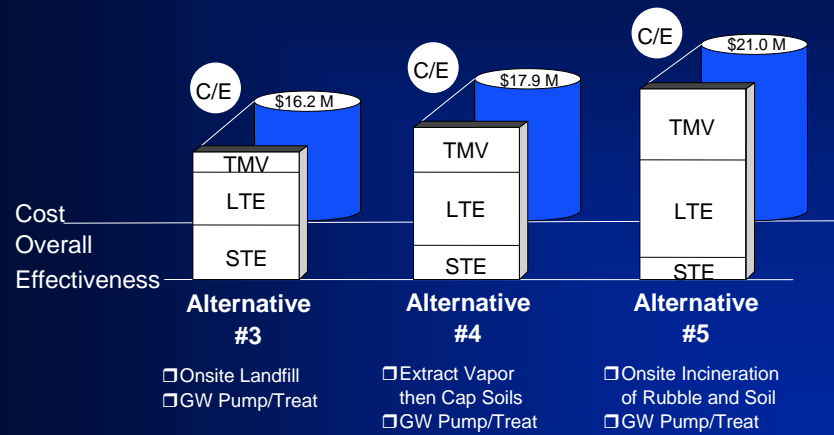
Example 2: Preferred Alternative No Longer Cost-Effective

- ❑ Alternative 4 proposed
- ❑ New information reveals incineration costs were overestimated
- ❑ Reevaluate cost-effectiveness analysis and “MEP” determination as part of balancing

38

- As in Example 1, Alternative 4 was proposed as the preferred alternative in this example.
- However, new information reveals that incineration costs were overestimated. The analysis must state why incineration costs were overestimated and why the new information is better.
- As a result of the new information, cost-effectiveness and the MEP determination will be reevaluated.

Example 2: Final C/E Analysis



39

- This graphic shows that Alternative 5 is more cost-effective than was originally believed.

Example 2: Final "MEP" Balancing

Protective, ARAR-Attaining, and C/E Alternative Eligible for Selection

Alternative #3

- ☐ Onsite Landfill
- ☐ GW Pump/Treat

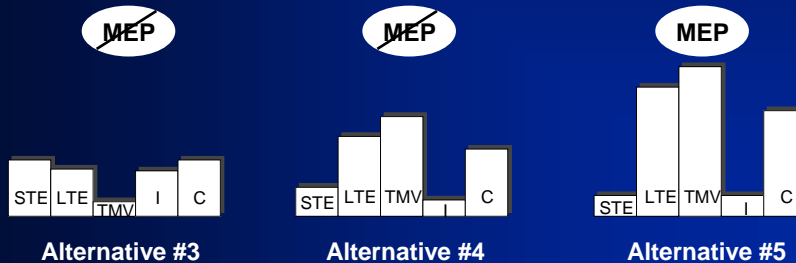
Alternative #4

- ☐ Soil Vapor Extraction
Followed by Cap
- ☐ GW Pump/Treat

Alternative #5

- ☐ Onsite Incineration
(Clean Closure)
- ☐ GW

Select Alternative Affording Best Balance



40

- Three alternatives are now considered in the MEP balancing.
- Alternative 5 is selected as the remedy because it affords the best balance between the criteria and the preference for treatment.
- Variations in assumptions do not have to be large to have potentially significant effects on the final balancing analysis.
- This would be considered a "major" change because the type of treatment involved is much different than previously considered.

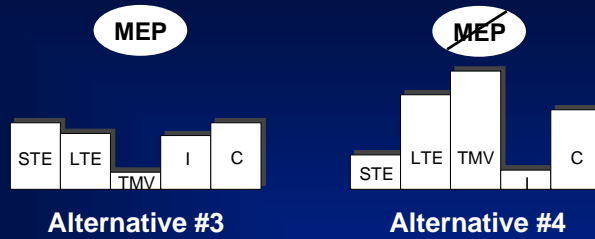
Example 3: Preferred Alternative No Longer Provides Best Balance

- ❑ **Alternative 4 proposed**
- ❑ **New information reveals soil vapor extraction
more difficult to implement than previously
believed**
- ❑ **“MEP” determination reconsidered**

41

- Again, the preferred alternative is the same as that for the other examples.
- However, new information reveals that the technology to be used in the preferred alternative, soil vapor extraction, will be difficult to implement. Late treatability studies or site characterization information can often lead to this situation.
- As a result, it is necessary to reevaluate the MEP determination.

Example 3: Final MEP Decision



- ❑ Rebalancing reveals Alternative 3 is most appropriate solution for the site....providing the best balance
- ❑ No discernable difference between Alternatives in terms of support agency or community acceptance

Example 4: Community Opposition Leads to Selection of Remedy Other Than Preferred Alternative

- ❑ Alternative 4 proposed
- ❑ Community objects to long implementation time of soil vapor extraction and incineration
- ❑ Objection causes lead agency to reconsider “MEP” determination

43

- In this final example, Alternative 4 is once again proposed. This time, the community objects to the time required to implement the remedy.

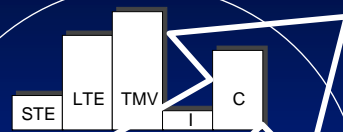
Example 4: Final MEP Balancing

"MEP"?



Alternative #3

- ❑ Onsite Landfill
- ❑ GW Pump/Treat
- ❑ 2 Year Implementation Time



Alternative #4

- ❑ Soil Vapor Extraction Followed by Cap
- ❑ GW Pump/Treat
- ❑ 5-8 Year Implementation Time

**Strong
Community
Objection**

- Community concerns may outweigh the preference for treatment.

Module Summary

- The remedy selection process includes the following steps:
 - Identify preferred alternative
 - Conduct internal briefings and support agency review on draft FS and proposed plan
 - Solicit public comment on final proposed plan and RI/FS report
 - Conduct internal briefings and support agency review on draft ROD
 - Select final remedy
 - Sign final ROD

Module Summary (con't)

- The purpose of the proposed plan is to facilitate public participation in the remedy selection process
- The proposed plan summarizes all the alternatives that were considered, highlighting the key factors which led to the identification of the preferred alternative

Exercise 5: Remedial Alternatives Selection Exercise

□ Exercise Objectives:

- Introduces students to the process of remedial alternative selection**
- Students are also able to look at the selection process from various roles**